observatories. Exner's researches on atmospheric electricity at the Sonnblick Observatory are also important.

Yet, with all these observational achievements, it must be confessed that the present status of meteorology is very disappointing. Within the century the world has seen physics, chemistry, biology, and other now recognized sciences emerge from their previous uncertain and indefinite condition, but meteorology is comparatively at a standstill. While much is known from thousands upon thousands of observations, many of the fundamental problems are not yet solved. Fifteen years ago von Helmholz turned his attention to the hydrodynamics of the atmosphere; but, so far as meteorology is concerned, this great man left his work unfinished. Recently excellent theoretical researches have been undertaken by Brillouin and Pockels on the formation of clouds and rain; by von Bezold, Herz, Margules, and Neuchoff on the thermodynamics of the atmosphere; by Kitao, Mohn, Sprung, Bjerknes, and Bigelow on the hydrodynamics of the atmosphere. Wild, Eckholm, Pernter, and Marchi have been prominent workers in the other field of the physics of the atmosphere. It appears, however, that not very much has been added to dynamic or theoretical meteorology since the publication of Ferrel's and Oberbeck's works. Meteorological generalizations at present are too indefinite, ascertained ideas too scanty and disjointed in their connection, to form fundamental principles. Any student of mathematical physic who peeps into this adjoining field must feel that he is like a bat in the dark, flying at the gleams of light from a closely curtained window. If science carries with it the idea of precision, meteorology must certainly be in the early stage of science.

And why is it that the advancement of modern meteorology is so slow? Is it because of the lack of complete meteorological data, notably in the upper regions of the atmosphere, or of the complexity of atmospheric phenomena? Or, will natural difficulties never yield to mathematical analysis until new methods of analysis shall have been developed? Whichever the case may be, what meteorology needs for its future advancement is a man like Newton, Laplace, Lagrange, Gauss, Poisson, or Fourier in astronomy and mathematics; Faraday, Maxwell, Helmholtz, Kelvin, or Stokes in physics; Bunsen, Mendeleff, or Van't Hoff in chemistry; or Charles Darwin in biology. Machines without a power to move on are useless, or the mere accumulations of observational data and mere possession of a new analysis are worthless without competent men to handle them. It appears that the brain of a genius is a mysterious workshop. Often, or rather almost always, this workshop is supplied with poor materials, and yet he builds up a wonderful thing out of them, which appears sometimes to be almost supernatural. A striking example of this is Clark Maxwell in the discovery of the electromagnetic theory. Before Hertz's famous experiments on electric waves or before the discovery of Röntgen rays, Maxwell used a few common physical hypotheses or data in building up his theory, but later, when his mathematical structure was complete, he cast aside the ladder, leaving so broad and comprehensive a system that Hertz once said that it is best defined as Maxwell's system of equations. For a long time Maxwell's theory was regarded as mere mathematical jugglery until Hertz eventually proved that it is physical reality. Another example of the kind is Fourier in constructing the mathematical theory of conduction of heat, the application of which principle to electricity made Ohm so famous. Fourier's theory had been discovered before any of the modern theories of heat was discovered. Or, did new experimental facts affect Fourier's theory?

The highest meteorological research will demand in the future the possession of the highest mathematical faculty, combined with experimental skill. It was a great misfortune to meteorology that a great genius like Maxwell did not attack our problems, or that Helmholtz died without completing his meteorological researches. Or if we had in our field Prof. Willard Gibbs, the most profound American mathematician, who has done so much for thermodynamics and the theory of gases, American meteorology might have been in a better condition. It is a great mistake that practical meteorologists have an aversion to the application of modern analysis in the study of meteorology. Experiments and mere reasoning can not go beyond certain steps. Instead, the history of science shows that mathematical analysis discovers the hidden chain which unites facts so widely distant from each other that ordinary reasoning could not even suspect their connection. At present we can not tell whether our present method of mathematical analysis is enough, or whether we shall need a new analysis for our purpose, but it is certain that the highest training in mathematical physics on the part of young meteorologists is not merely important but indespensable to the future advancement of meteorology. At the same time, meteorologists must invite eminent mathematicians and mathematical physicists to their field. Only thus may the observational data of the upper atmosphere or of the lower yield the best results, and meteorology may be able to enter the field of exact sciences.

INAUGURATION OF PRESIDENT DABNEY.

Dr. Charles W. Dabney, Assistant Secretary of Agriculture during President Cleveland's second administration, was installed as president of the University of Cincinnati on November 15–16, 1904, and, in the absence of Secretary Wilson and the Chief of the Weather Bureau, Prof. F. H. Bigelow had the pleasure of representing the Department on that occasion. Dr. Dabney has resigned his work as president of the University of Tennessee, and he has been welcomed most heartily into his new office at Cincinnati. The inaugural ceremonies were elaborate and enthusiastic, and a large number of educational institutions sent official delegates to take part in the exercises. The University of Cincinnati is a municipal institution, like the College of the City of New York; it has a beautiful site in the Burnet Woods Park, is well equipped with large buildings, and at present has about 1300 students in attendance. All those who were associated with Dr. Dabney during his residence in Washington will be pleased to know that he has fine prospects of performing a very useful work at Cincinnati.—*F. H. B.*

SEPTEMBER FLOODS IN THE SOUTHWEST.

The following reports of the recent floods in the Southwest were received too late for publication in the MONTHLY WEATHER REVIEW for September, 1904. They will be found very interesting as well as instructive. Those in New Mexico and southeastern Colorado were probably unprecedented, both as to volume of water and extent of territory affected, and their effect upon future engineering problems will doubtless be most pronounced. The Rio Grande floods were not so severe, yet the stages reached were quite high, and considerable damage was done to growing crops.

Among the lessons of these floods is the suggestion that the River and Flood Service of the Weather Bureau may be extended in these regions with at least a fair degree of utility. Two officials of the Bureau are now on the ground, examining the flooded districts with this end in view.—*H. C. Frankenfield, Professor.*

THE FLOODS IN SOUTHEASTERN COLORADO.

By F. H. BRANDENBURG, District Forecaster, Denver, Colo.

Flood stages occurred in a number of streams in southeastern Colorado on September 30 and October 1. The Purgatoire, or Picketwire, as it is known locally, on whose watershed the principal flood had its origin, rises in the Culebra

Range of mountains. The main stream, after receiving a number of tributaries rising to the southward in the Raton Mountains, empties into the Arkansas two miles east of Las Animas. Although draining 3040 square miles, the stream normally carries very little water; in fact, it is almost dry in its lower part, especially during summer and autumn.

In Colorado rain set in over the drainage area on the 27th and continued until the afternoon of the 30th. Along the Arkansas the fall was generally between one and two inches, while on the watershed of the Purgatoire, in Huerfano and Las Animas counties in Colorado, and in northern New Mexico it ranged from about four inches in the western part of Las Animas County to nearly six inches in the vicinity of Trinidad, and to about seven inches near the headwaters of the tributaries rising in the Raton Mountains in northern New Mexico. The entire upper watershed being a mountainous region, the run-off was great and rapid.

At Trinidad, where the flood was most disastrous, the loss probably reached $600,000. The river rose very rapidly; at 2 a. m. of the 30th it went over its banks, and at 3:30 a. m. it had spread a block or more on each side. Every bridge in the city, except one, was carried away; the Santa Fe railroad station was demolished, and 30 city blocks along the river were covered from two to four feet deep. The electric light and gas plants were flooded, leaving the city in darkness. The railroads sustained a large loss by washouts and a prolonged interruption to traffic. Ranchmen along the river for 50 miles or more lost their crops; in some instances they sustained considerable loss by the cutting done by the flood, and in others sand ruined much valuable farming land.

Before the flood in the Purgatoire reached the Arkansas that stream was somewhat swollen as a result of the rains, but the volume carried did not exceed 3000 second-feet. The great volume brought by the Purgatoire caused the Arkansas to leave its banks and attain a height equal to the high-water mark reached about 40 years ago. All bridges between Las Animas and the State line, except one at Granada, were washed out; bottom lands were badly washed or covered with sand; long stretches of railroad track were carried away or undermined, the damage being estimated at $200,000. At Lamar, about 30 miles east of the mouth of the Purgatoire, the flood stages were first noted about 6 a. m., October 1, and the water continued to rise steadily until 4 p. m. At the highest stage the river was fully one and a half miles wide. The river subsided slowly from that time until Tuesday, when it was again at its normal stage.

RECENT FLOODS IN THE RIO GRANDE VALLEY.

By W. H. ALEXANDER, Observer, Weather Bureau, Galveston, Tex.

The continuous and at times heavy rains that fell over western and southwestern Texas and southeastern New Mexico during September and the early part of October, 1904, kept the Rio Grande on the verge of overflowing its banks at various places along its course during this entire time, and on several occasions, and at a number of places it did overflow and flood the valley. The property loss in Texas on account of these overflows seems not to have been very great, but the inhabitants of the valley were kept in a state of constant alarm.

On the 8th of September the river observer at Eagle Pass, Tex., sent the following message to points below:

River up seven feet and rising. Heavy rains reported above here.

On the 14th the following:

River now up sixteen feet, and rising six inches per hour. Eight a. m.

On the 15th the following:

Twenty-two feet. Slowly rising. Continued light rains here.

On the 16th the following:

Reached twenty-four feet last night. Now falling.

From gage readings kindly furnished by Mr. W. W. Follett, United States Consulting Engineer, El Paso, Tex., it appears that the river at El Paso gradually rose from September 1 to 15, after which a gradual fall began. The highest reading recorded was 14.0 feet in the afternoon of the 15th.

Another series of readings from a gage located near Devils River Station, Tex., shows a gradual rise in the river from September 5 to 10, and a very rapid rise from the 10th to the 15th. The maximum reading recorded at this station was 28.1 feet on the afternoon of the 14th and the forenoon of the 15th. Gage readings at Fort Ringgold, Riogrande, Tex., show that the river at that point rose from 20 feet on the 10th to 30 feet on the 16th, and then began to fall.

The postmaster at Delrio, Tex., advises that the river at that point overflowed its banks on the 12th and 13th of September to a depth of seven feet, the water extending from 300 to 700 yards from the river bed, and causing an estimated property loss in that immediate vicinity of $500.

At Riogrande, Tex., the river overflowed its banks from September 16 to 22, resulting in the complete destruction of all crops planted along the river valley and a number of small shacks or huts. The crops destroyed were largely on truck farms, although a few cotton fields were also destroyed. It is intimated that the losses were heavier farther down the river, but no authentic information relative thereto has been received at this office.

During the last week of September very heavy rains fell in the upper Rio Grande Valley, especially in New Mexico, causing an overflow of the river in the vicinity of El Paso, Tex., and above, resulting in the loss of considerable property, principally railroad property, along the river in southern New Mexico. Just above El Paso a dike gave way and the water spread rapidly across and down the valley, forming lakes and streams, a part finally returning to the river channel. The damage to lands and buildings by reason of this overflow is estimated at $5000 or less.

On October 15, 1904, the observer at El Paso, Tex., advised the stations below as follows:

No decided rise in surface of river last three or four weeks, but bottom has scoured out until average depth at point of average width appears to be seven or eight feet and water running fast.

The gage readings at El Paso show that the highest stage, 24.0 feet, was reached at 11 p. m. of the 15th of October. No authentic information has been received at this office of damages, if any, resulting from this rise in the river. They are believed to have been unimportant.

THE GREAT FLOODS OF SEPTEMBER IN NEW MEXICO.

By J. B. SLOAN, Observer, U. S. Weather Bureau, Santa Fe, N. M. *Revised reprint from* Report for September, 1904, New Mexico Section of the Climate and Crop Service of the Weather Bureau.

Between the 26th and 30th of September very heavy, steady rains fell over nearly the entire Territory, causing the most extensive and destructive floods in its history. The greatest damage occurred on Thursday morning, September 29, over the eastern slopes of the mountains and along the valleys and lowlands of the northern portion, but the floods were nearly as destructive over the eastern slope of the several mountain ranges in the southwest portion, and over the Hondo basin in the southeast. The reports from the voluntary observers show that from three to seven inches of rain fell in twenty-four to forty-eight hours, extending over an area about three hundred by five hundred miles. It is simply impossible to conceive the volume of water which this means; millions of tons, all rushing toward the sea, down the steep canyons and rapidly decreasing slopes of the valleys, carrying death and destruction in its path, for nothing placed by man can withstand the onward rush of the flood waters. An eye witness of a portion of the flood gave a vivid description of the meeting of the Mora and Sapello rivers, about a quarter of a mile above Watrous, in the following words: